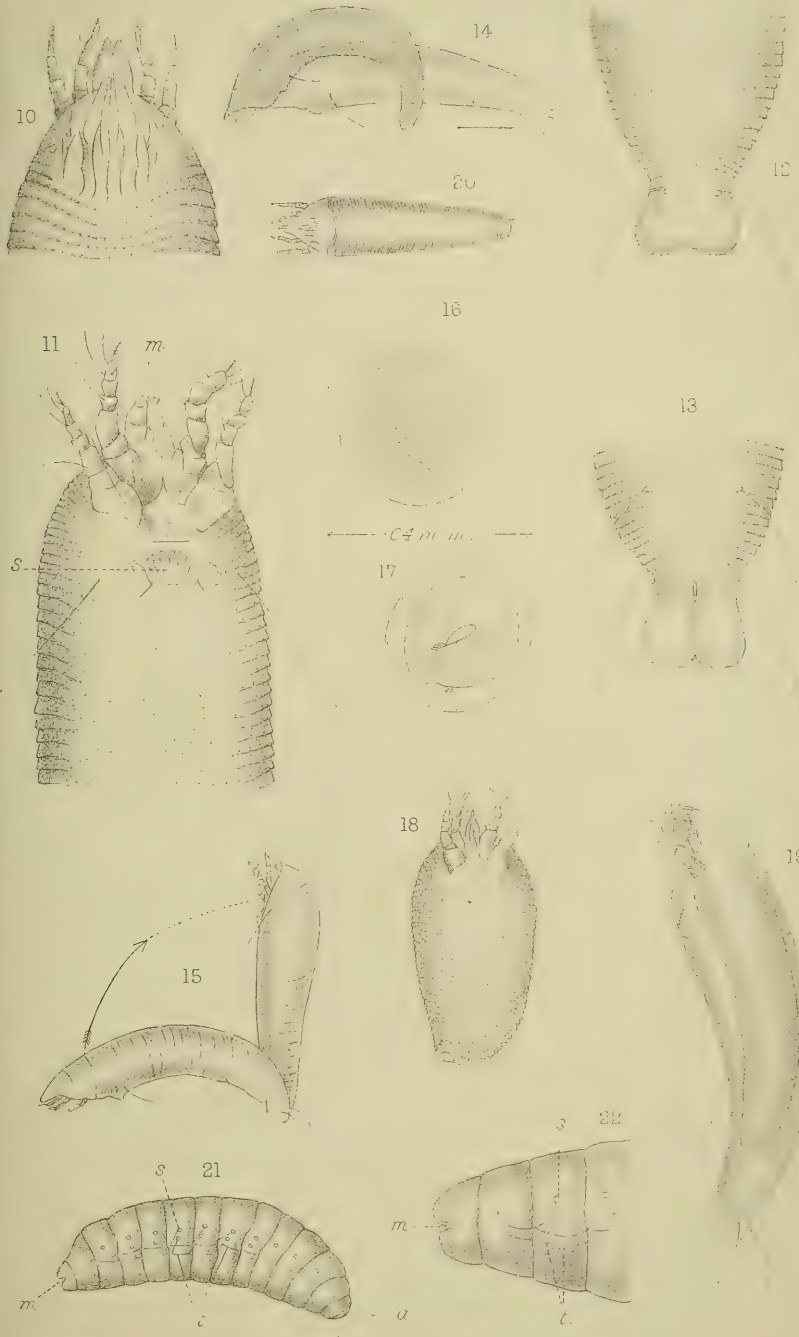


Alice L. Embleton del. ad nat.
A. R. Hammond lith.

West, Newman imp.

ERIOPHYES (PHYTOPTUS) RIBIS.

On the Foraminifera collected round the Funafuti Atoll from Shallow and Moderately Deep Water.

By Frederick Chapman, A.L.S., F.R.M.S.

[Read 5th December, 1901.]

(Plates 35 & 36.)

Contents.

I. Introductory Remarks.

The collections upon which the following results are based are these:—

(1) A series of shore-sands from the ocean and lagoon-beaches of the Funafuti Atoll. Obtained by Prof. W. J. Sollas, F.R.S., during the first expedition to Funafuti in 1896.

(2) Samples from the rocks forming the seaward slope of the reef at depths from 16–200 fathoms, obtained by means of heavy steel chisels and tangles; also samples of sand from various depths. Collected by Prof. Edgeworth David and Mr. Woolnough in 1897.

(3) A series of sand and reef-rocks collected by Messrs. G. Halligan and A. E. Finckh round the Atoll at depths down to 240 fathoms. Also soundings and dredgings taken along a line due west from Tutanga. Collected in August 1898.

During my microscopical examination of the thin slices of the cores brought up by the boring operations at Funafuti it was evident that, in order to arrive at some definite conclusions respecting the meaning of the various changes in the facies of the foraminifera and other microzoa found at different levels, we ought to know more about the actual distribution of the microzoa living round the atoll and in the lagoon. By a careful study of the differences in the distribution of the smaller organisms it is possible to gain information of considerable value as to the depth at which they best developed, and also with regard to the accompanying physical or hydrographical conditions. The present paper should therefore serve as a basis for the discussion of the significance of the contents of the core as far as the foraminifera are concerned (and these organisms, by the way, constitute the greater proportion of the Funafuti core), since the results are derived from samples obtained from fairly shallow-water deposits, speaking in the hydrographical sense.

This interesting subject, in its bearing on the contents of the core, may be discussed in a later paper of this series.

The deep-sea soundings taken round Funafuti are also of considerable interest, and their description may be reserved for another paper on the subject.

II. Foraminifera *from the* Ocean-Beaches, Funafuti, *from material collected by* Prof. Sollas, 1896.

Note.—The actual label-names attached to the samples of sands have the following signification, and the native name alone is here retained:—"Our Islet" = Fongafale Islet or Funafuti Island; "South Island" = Avalau Islet; "Gold Island" = Fualopa Islet.

The following terms in the Table denote the relative abundance of the specimens:—v.r. = very rare; r. = rare; f. = frequent; c. = common; v.c. = very common; ex.c. = excessively common.

	Name.	N. end Fongafale Islet.	Avalau Islet.	Fualopa Islet.
1.	*Nubecularia lucifuga*, Defr.	.....	...	v.r.
2.	,, *Bradyi*, Millett	.....	r.	
3.	,, *lacunensis*, Chap.	.....	r.	
4.	,, *divaricata*, Brady	.....	r.	
5.	*Biloculina irregularis*, d'Orb.	.....	r.	
6.	,, *ringens* (Lam.)	.....	...	r.
7.	*Spiroloculina nitida*, d'Orb.	.....	v.r.	
8.	,, ,, var. *foveolata*, Egger	.....	f.	
9.	,, *canaliculata*, d'Orb.	.....	v.r.	
10.	,, *acutimargo*, Brady	.....	f.	
11.	,, *antillarum*, d'Orb.	.....	r.	
12.	,, *grata*, Terq.	.....	f.	
13.	,, *crenata*, Karrer	.....	v.r.	
14.	*Miliolina circularis* (Born)	.....	c.	
15.	,, ,, var. *sublineata*, Brady	.....	v.r.	
16.	,, *subrotunda* (Mont.)	.....	v.r.	
*17.	,, *labiosa* (d'Orb.)	.....	c.	
18.	,, *trigonula* (Lam.)	.....	v.r.	
19.	,, *oblonga* (Mont.)	.....	c.	
20.	,, *Bosciana* (d'Orb.)	.....	f.	
21.	,, *seminulum* (L.)	.....	f.	
22.	,, *funafutiensis*, Chap.	.....	v.r.	
23.	,, *Boueana* (d'Orb.)	.....	v.r.	
24.	,, *Cuvieriana* (d'Orb.)	.....	r.	r.
25.	,, *tricarinata* (d'Orb.)	.....	v.r.	
26.	,, ,, var. *Bertheliniana*, Brady.	.....	c.	c.
27.	,, ,, var. *Terquemiana*, Brady.	.....	v.r.	
28.	,, *bicornis* (W. & J.)	.....	...	v.r.
*29.	,, *agglutinans* (d'Orb.)	.....	c.	
*30.	,, *Ferussacii* (d'Orb.)	.....	c.	f.
31.	,, *Linneana* (d'Orb.)	.....	f.	
32.	,, *undosa* (Karrer)	.....	r.	
33.	,, *reticulata* (d'Orb.)	.....	v.c.	v.c.
34.	,, *Parkeri* (Brady)	.....	f.	r.
35.	*Articulina funalis*, var. *inornata*, Brady	.....	v.r.	
36.	*Hauerina compressa* (d'Orb.)	.....	r.	
37.	,, *ornatissima* (Karrer)	.....	v.r.	
38.	*Planispirina exigua*, Brady	.....	r.	
39.	*Sigmoïlina celata* (Costa)	.....	f.	
40.	*Cornuspira involvens*, Reuss	.....	v.c.	
41.	*Peneroplis pertusus* (Forskål)	.....	c.	
42.	,, *arietinus* (Batsch)	.....	f.	
*43.	(*Monalysidium*) *cylindraceus* (Lam.).	.....	f.	
44.	,, (*M.*) *lituus* (Gmelin)	.....	v.r.	
45.	,, (*M.*) *Sollasi*, Chap.	.....	v.r.	
46.	*Orbitolites marginalis* (Lam.)	r.	ex.c.	c.
47.	,, *duplex*, Carpenter	.....	r.	
48.	,, *complanata*, Lam.	v.c.	f.	ex.c.

* See notes appended to this list.

	Name.	N. end Fongafale Islet.	Avalau Islet.	Fualopa Islet.
*49.	*Orbitolites complanata*, var. *plicata* (Dana)	.....	...	r.
*50.	*Haddonia minor*, sp. nov.	.....	v.r.	
51.	*Textularia rugosa* (Reuss)	.....	r.	
52.	„ *conica*, d'Orb.	.....	f.	
*53.	*Verneuilina spinulosa* (Reuss)	.....	r.	
54.	*Valvulina Davidiana*, Chap.	.....	r.	
55.	*Clavulina angularis*, d'Orb.	.....	f	
56.	*Bolivina limbata*, Brady	.....	f.	
57.	„ *tortuosa*, Brady	.....	v.r.	
58.	*Sagrina raphanus*, P. & J.	.....	c.	
59.	*Globigerina sacculifera*, Brady	.....	v.r.	
60.	*Spirillina vivipara*, Ehr.	.....	v.r.	
61.	„ *inæqualis*, Brady	.....	r.	v.r.
62.	„ *spinigera*, Chap.	.....	v.r.	
*63.	*Patellina corrugata*, Will.	.....	v.r.	
64.	*Cymbalopora Poeyi* (d'Orb.)	.....	c.	c.
*65.	„ „ var. *squamosa* (d'Orb.)	.....	f.	
66.	„ *tabellæformis*, Brady	.....	r.	r.
67.	„ (*Tretomphalus*) *bulloides* (d'Orb.)	.....	v.r.	
68.	*Discorbina araucana* (d'Orb.)	.....	...	v.r.
69.	„ *Vilardeboana* (d'Orb.)	.....	v r.	
70.	„ *rosacea* (d'Orb.)	.....	r.	
71.	„ *rugosa* (d'Orb.)	.....	v.r.	
72.	„ *globularis* (d'Orb.)	.....	f.	v.r.
73.	„ *tabernacularis*, Brady	.....	f.	
*74.	„ *acuminata*, sp. nov.	.....	r.	
75.	„ *concinna*, Brady	.....	r.	
76.	„ *orbicularis* (Terq.)	.....	c.	v.r.
77.	*Planorbulina larvata*, P. & J.	.....	v.r.	
78.	„ *acervalis*, Brady	.....	c.	
*79.	„ *retinaculata*, P. & J.	.....	r.	
80.	*Truncatulina lobatula* (W. & J.)	.....	v.r.	
81.	„ *variabilis* (d'Orb.)	.....	v.r.	
82.	„ *rostrata*, Brady	.....	v.r.	
83.	„ *reticulata* (Czjzek)	.....	v.r.	
84.	*Anomalina coronata* (P. & J.)	.....	r.	
*85.	*Calcarina Spengleri* (L.)	.....	...	f.
86.	„ *hispida*, Brady	.....	v.c.	f.
87.	„ „ var. *pulchella*, Chap.	.....	f.	
88.	*Tinoporus baculatus* (Montf.)	c.	ex.c.	ex.c.
*89.	„ „ var. *florescens*, nov.	.....	r.	
90.	*Gypsina inhærens* (Schultze)	.....	v.r.	f.
91.	„ *globulus* (Reuss)	.....	v.r.	v.r.
92.	*Polytrema miniaceum* (Pallas)	c.	v.r.	c.
93.	*Polystomella striatopunctata* (F. & M.)	.....	f.	
94.	„ *macella* (F. & M.)	.....	v.r.	
95.	„ *crispa* (L.)	.....	r.	
96.	*Amphistegina Lessonii*, d'Orb.	c.	ex.c.	ex.c.
97.	*Heterostegina depressa*, d'Orb.	.....	f.	f.

* See notes appended to this list.

Of the foregoing samples of foraminiferal sands from the seaward beaches of Funafuti, that from Avalau Islet is by far the richest in organisms. The Foraminifera are there in great profusion, and the species very numerous for a coral area; the specimens themselves are beautifully preserved, even down to the most delicate ornamentation of spines and the perfect contour of the shell in many of the fragile forms.

Besides the Foraminifera we find in the sand of Avalau Islet fragments of calcareous Algæ, spicules of a Calcisponge, Alcyonarian spicules, a few Heteropods and numerous Ostracoda; the valves of the last-named organisms are more than usually abundant and varied, and these, together with other Ostracoda from Funafuti, will be enumerated and described in a separate paper.

The sand here examined from Fongafale Islet is water-worn and perhaps wind-polished, so that the result—the occurrence of five species only of Foraminifera—is not surprising.

We now proceed to the description of new species, and notes on the more remarkable forms of the Foraminifera occurring in the beach-sands of Funafuti.

Notes on the Foraminifera of the Beach-Sands, Funafuti.

Miliolina labiosa (*d'Orbigny*).

The specimens from Avalau Islet exhibit the same tendency to merge into *Nubecularia Bradleyi*, Millett, by growing irregularly in a lateral direction until the milioline character is entirely lost, which Millett remarks in his description of the Malay foraminifera *. There are apparently no specimens from Funafuti, such as were found in the Malay soundings, which pass into *Miliolina valvularis* (Reuss).

Miliolina agglutinans (*d'Orb.*).

The form which is rather frequent at Avalau Islet partakes of the general characters of *M. Bosciana* (d'Orb.), and might perhaps with equal reason be assigned to that species. Millett figures a similar example from the Malay Archipelago †.

Miliolina Ferussacii (*d'Orb.*).

Probably more than half the number of specimens from Funafuti are represented by the flattened costate variety, formed

* Journ. R. Micr. Soc. 1898, p. 502.

† *Tom. cit.* p. 268, pl. iv. figs. 4 *a–c*.

almost on a spiroloculine plan, similar to the figure given by Millett of his Malay specimens *.

Peneroplis (Monalysidium) cylindraceus (*Lam.*).

A very delicate little form, which by its thin shell-structure and simple oral aperture seems to belong to the subgeneric type *Monalysidium*.

Orbitolites complanata, *Lam.*, var. plicata, *J. D. Dana*.

Marginopora vertebralis, Blainville, var. *plicata*, Dana, 1848, in Wilkes' United States Exploring Expedition Reports, "Zoophytes," p. 706, [in vol. of plates referred to as *Marginopora vertebralis*?] pl. 60. figs. 9 9 *a*, *b*.

Orbitolites laciniatus, Brady, 1881, Quart. Journ. Micr. Sci. vol. xxi. N. S. p. 47.

O. complanata, var. *laciniata*, Carpenter, 1883, Report on the Genus *Orbitolites*, Zool. Chall. Exp. part xxii. pl. vii.

This is the well-known thick variety of *Orbitolites* with the plicated margin, and which Brady showed to be a stage of shell-growth dependent on a phase of reproduction, since the edge bears chamberlets with megalospheric young. J. D. Dana described this variety as *plicata* in 1848, and H. B. Brady appears to have overlooked this when he described his specimens from Fiji and elsewhere.

Haddonia minor, sp. nov. (Pl. 36. figs. 1, 2.)

Test attached by the earlier segments, which are frequently grouped in a triserial manner, as in *Verneuilina*, &c.; afterwards growing erect or in a vermiform fashion, similar to *H. Torresiensis*, but is much smaller. Aperture horseshoe-shaped.

Average length of test 2–4 mm.; average diameter ·7 mm.

Avalau Islet; very rare.

Verneuilina spinulosa (*Reuss*).

The specimens from Avalau Islet are in very fine condition, and the spinous processes are exceptionally long.

Patellina corrugata, *Williamson*.

It is very unusual to find this species in low latitudes, but it is not unknown from such localities; it has, for instance, been recorded from Mauritius and elsewhere. It is, however, more abundant in temperate and colder areas.

* Journ. R. Micr. Soc. 1898, p. 507, pl. xii. figs. 7 *a–c*.

CYMBALOPORA POEYI, var. SQUAMOSA (*d'Orb.*).

Rotalia squamosa, d'Orb., 1826, Ann. Sci. Nat. vol. vii. p. 272. no. 8.

Rosalina squamosa, d'Orb., 1839, Foram. Cuba, p. 100, pl. iii. figs. 12–14.

Cymbalopora Poeyi, d'Orb., depressed var., Brady, 1884, Rep. Chall. vol. ix. p. 637, pl. cii. figs. 14 *a–d*.

This variety is a neat depressed form of the heavier subconical specific type; in its earlier stages it is sometimes found parasitic upon algæ.

DISCORBINA ACUMINATA, sp. nov. (Pl. 36. fig. 3.)

Test conical, elongate; the apex terminating in a sharp point. The inferior face deeply sunken. Chambers arranged in about six whorls, the segments long and set obliquely. Surface of test ornamented with radiating striæ centred in the apex and the umbilicus respectively. Height ·3 mm.; diameter ·2 mm.

Although *D. acuminata* is related to *D. tabernacularis*, Brady, it differs in having straighter and longer sides to the cone and a pointed aboral extremity.

Shore-sand, Avalau Islet, Funafuti; rare.

PLANORBULINA RETINACULATA, *Parker & Jones*.

Planorbulina retinaculata, P. & J., Phil. Trans. vol. clv. 1865, p. 380, pl. xix. fig. 2.

A wild-growing modification of *P. mediterranensis*, d'Orbigny, parasitic on shells or algæ, in which the chambers of the later whorls are partially separated, and bear numerous apertures especially around the periphery of the test. Parker and Jones's specimens were found in the West Indies. This form is especially worthy of notice, as it does not appear to have occurred often, if at all, since the original description was published. *P. retinaculata* occurs at Funafuti detached from their surfaces of support and mingled with the sand.

CALCARINA SPENGLERI (*Linné*).

This species appears to be almost exclusively confined to the East Indian Archipelago, and therefore its occurrence at Funafuti in at least one of the samples of beach-sands is interesting as adding to its geographical range. The Funafuti specimens are small but typical.

Tinoporus baculatus (*Montfort*), var. florescens, nov. (Pl. 36. fig. 4.)

This variety has its distinguishing feature in the curious dehiscent or florescent terminations of the spurs of the test. This is proved by thin sections to be formed by the redundant overgrowth of the acervuline or compressed outer layers of chamberlets upon the intermediate shell-growth forming the spurs. This overgrowth is very thin, and covering the spurs forms a recurved edge around their extremities. Occurs at Avalau Islet.

III. Foraminifera *from the* Lagoon-Beaches, Funafuti.

Two samples of the foraminiferal sand of the lagoon-beaches are noticed here, with the species of foraminifera found therein. One is from Funafuti Island (Fongafale I.), collected by Prof. Sollas in 1896; the other from the S.E. of the Atoll at Funafala Islet, collected by Messrs. Halligan and Finckh in 1898.

The dredgings taken across the lagoon commencing off Fongafale at a depth of 10 fathoms have been microscopically examined for foraminifera and already reported upon *.

	Name.	Lagoon-beach at Fongafale I.	Lagoon-beach S. end of Funafala I.
1.	*Nubecularia divaricata*, Brady	.....	v.r.
2.	„ *lucifuga*, Defrance	v.r.	
3.	„ *lacunensis*, Chapman	.....	v.r.
4.	*Spiroloculina nitida*, d'Orb.	.....	r.
5.	„ „ var. *foveolata*, Egger.	.....	v.r.
6.	„ *grata*, Terq.	.....	.
7.	„ *antillarum*, d'Orb.	.....	v.r.
8.	*Miliolina seminulum* (L.)	.....	c.
9.	„ *oblonga* (Mont.)	v.r.	
10.	„ *trigonula* (Lam.)	.....	r.
11.	„ *tricarinata* (d'Orb.), var. *Bertheliniana*, Brady.	f.	v.r.
12.	„ *tricarinata*, var. *Terquemiana*, Brady.	f.	
13.	„ *reticulata* (d'Orb.)	r.	c.
14.	„ *Ferussacii* (d'Orb.)	.....	v.r.
15.	*Peneroplis pertusus* (Forskål)	.....	f.
16.	„ *arietinus* (Batsch)	.....	r.
17.	*Orbitolites complanata*, Lam.	v.c.	v.c.
18.	„ *marginalis* (Lam.)	r.	c.

* See Journ. Linn. Soc., Zool. vol. xxviii. pp. 161–210.

	Name.	Lagoon-beach at Fongafale I.	Lagoon-beach S. end of Funafala I.
19.	*Textularia gramen*, d'Orb.	.....	v.r.
20.	,, *rugosa* (Reuss)	.....	f.
21.	,, *siphonifera*, Brady	.....	v.r.
22.	*Clavulina angularis*, d'Orb.	.....	v.r.
23.	*Valvulina Davidiana*, Chapman	.....	v.c.
24.	*Sagrina raphanus*, Parker & Jones	.....	r.
25.	*Cymbalopora Poeyi* (d'Orb.)	v.r.	c.
26.	*Discorbina globularis* (d'Orb.)	.....	v.r.
27.	*Truncatulina Akneriana* (d'Orb.)	.....	v.r.
28.	*Calcarina hispida*, Brady	c.	v.c.
29.	*Tinoporus baculatus* (Montf.)	ex.c.	v.c.
30.	*Gypsina inhærens* (Schultze)	v.r.	
31.	,, *vesicularis* (P. & J.)	v.r.	
32.	*Polytrema miniaceum* (Pallas)	c.	c.
33.	*Amphistegina Lessonii*, d'Orb.	ex.c.	v.c.
34.	*Heterostegina depressa*, d'Orb.	v.r.	v.r.

IV. *A* Description *of the* Reef-fragments *obtained from the* Reef-face, Funafuti, *upon which* adherent Foraminifera *have been found.*

It seems desirable to keep the description of this series of specimens distinct from the foraminiferal sands, chiefly in order to show how important a part the larger encrusting and adherent foraminifera play in forming the growing reef, a fact which has been brought into prominence by the evidence of the Funafuti collections, both of the core and the samples dredged up from the living reef. These reef-samples are here arranged, firstly, in their order of position around the Atoll from N., E., S., to W., and, secondly, in the order of the depth from which they were dredged. The foraminiferal sands which are described subsequently are arranged in order of depth; the bathymetrical distribution of the various organisms may thus be readily seen.

N.W. of Pava I., 63 fathoms (1897).

Two reef-specimens. (1) An encrusting mass of *Polytrema planum* measuring 3 cm. × 2·75 cm. This specimen was evidently torn off the reef at a weak point of attachment. It is smooth exteriorly, with a slightly undulate surface, and shows on the under, attached, surface a rudely concentric manner of growth.

At one side of this specimen a full-grown megalospheric test of *Cycloclypeus Carpenteri* has been partially encrusted and overgrown by the *Polytrema*.

Pava I., 240 fathoms (1898).

Specimen A 51.

A deep-sea coral with numerous adherent tests of *Carpenteria balaniformis*, and a doubtful specimen of *C. rhaphidodendron*.

Funamanu (Beacon Id.), 25 fathoms.

An alcyonarian stem encrusted in places with a pale green *Polytrema planum* and a species of bryozoa, and bearing on its surface numerous specimens of *Carpenteria monticularis*, *C. utricularis*, and *Polytrema miniaceum*.

Funamanu (Beacon Id.), 45 fathoms (coll. A).

A somewhat thin and flexuose piece of reef-rock measuring 5 cm. × 3 cm., encrusted with algæ, foraminifera, hydrozoa, and bryozoa.

The foraminifera are *Polytrema planum* and *P. miniaceum*, both represented only by young growths.

Funamanu (Beacon Id.), 50 fathoms (1897).

Specimen C 1.

Coral-rock encrusted with *Lithothamnion Philippii* var. *funafutiensis*, *Carpenteria monticularis*, *Polytrema planum*, *P. miniaceum* and var. *alba*, *Serpulæ*, and bryozoa.

Specimen C 2.

A thin fragment of coral-rock with adherent organisms—*Lithothamnion*, foraminifera, *Serpulæ*, and bryozoa. The foraminifera are *Sagenina frondescens*, *Bdelloidina aggregata*, *Carpenteria monticularis*, *C. utricularis*, and *Polytrema miniaceum*.

(2) Another specimen of *P. planum* growing on a base of hard ? coral-rock, measuring 3 cm. × 2 cm. The *Polytrema* has grown irregularly, forming thin layers. On the rougher side of this specimen *Carpenteria monticularis* occurs, and here and there are little patches of the pink *Polytrema miniaceum*.

Off Funamanu (Beacon Id.), 80 fathoms (1897).

Specimen C 6.

An axis of a Gorgoniid with an encrusting *Lithothamnion* and bryozoa, also some adherent foraminifera and *Serpulæ*. The foraminifera are *Carpenteria monticularis*, *Polytrema miniaceum*, and *P. planum*. Another similar fragment (see Pl. 35. fig. 2) shows, in addition to the above species, a good example of *Carpenteria utricularis* and a large mass of *Carpenteria rhaphidodendron*.

Off Funamanu (Beacon Id.), 80 fathoms (1898).

Specimens A 22.

Several fragments broken from the reef; some consisting almost entirely of successive layers of *Polytrema planum* having a snowy or frothy texture and appearance. Two of the fragments have well-developed specimens of *Carpenteria rhaphidodendron* adhering to their surfaces, one of them measuring 3 cm. in height. A fragment of *Turbinaria* perforated by *Cliona* carries several specimens of *Haddonia torresiensis* on one surface, and on the opposite face numerous bryozoa, a sponge, *Halimeda*, and the pink encrusting *Lithothamnion Philippii* var. *funafutiensis*, and the following foraminifera :— *Carpenteria monticularis*, *C. utricularis*, and *Polytrema miniaceum* in a young stage of growth.

Specimen A 24.

Two fragments of reef-rock, the upper surfaces of which are entirely overgrown with pure white examples of *Polytrema planum*. On the under surface bryozoa, *Serpulæ*, and *Polytrema miniaceum* occur.

Falefatu, 38 fathoms (1898).

Specimen A 19.

A piece of hard calcareous rock, measuring $18 \times 11 \times 4$ cm., overgrown on the upper surface with knobs and crusts of *Lithothamnion Philippii* var. *funafutiensis*, *Psammocora* sp., bryozoa, and brachiopoda (*Crania*). Also the foraminifera *Polytrema planum* and *P. miniaceum*. The corals are chiefly adherent to

the upper (cleaner) surface, the bryozoa on the lower surface, whilst *P. planum* and *P. miniaceum* are on both surfaces.

Off Tutanga, 60–100 fathoms (1898).

Specimen A 35.

A fragment of reef-rock measuring 7·5 × 4·5 cm., encrusted with *Polytrema planum*, which almost completely covers the specimen. There are also a few thin crusts of *Lithothamnion Philippii* var. *funafutiensis* associated with it, and an example of *Cycloclypeus Carpenteri* (form B), measuring 2·5 cm. in diameter. The base of the rock is cavernous and drilled by boring organisms.

Off Tutanga, 115–200 fathoms (1898).

Carpenteria balaniformis very numerous on deep-sea corals (*Oculinidæ*).

Off Tutanga, 117 fathoms (1897).

Specimen A 32.

A rough, irregular fragment of reef-rock, measuring about 10 × 9 × 6 cm., consisting of an aggregate of organisms, as foraminifera, minute corals, hydrozoa, and *Serpulæ*, solidified by intergrowth and encrustation. By far the larger mass of the rock is formed of the encrusting and cementing organism *Polytrema planum*, which here still retains the pale green colour so frequently seen in living specimens. This green coloration gives to the *Polytrema* an illusionary resemblance to an alga. The large form (B) of *Cycloclypeus Carpenteri* is represented in this block by a specimen measuring 5 cm. in diameter, whilst there are numerous examples of the smaller form (A) embedded between the other organisms.

Off Tutanga, 135 fathoms (August 1898).

Specimen B 7.

A collection of reef-fragments ; consisting of some large masses of *Polytrema planum* (see Pl. 35. fig. 4), one or two measuring about 5 cm. square ; some lamellibranch shells overgrown inside and out with *Serpulæ* and *Polytrema planum* ; fungoid corals accreted with growing organisms, chiefly *Polytrema planum* ; a fragment of an alcyonarian stem measuring 4·5 cm. in length

and having a diameter of 1·8 cm., encrusted with *Polytrema planum*, which has ensured its preservation.

Dredgings taken near Tutanga (bearing 102° to Tutanga, 155° to Tegasu), 136 fathoms (1897).

Fragmentary rock-specimens and *Halimeda*-joints. One piece consisting of an encrusting mass of *Polytrema planum* measures 3 × 2 cm. and is 4 mm. thick. The outer surface is smooth and of a very pale green colour. To the under surface a fine specimen of *Haddonia torresiensis* is attached.

The smaller fragments bear numerous dark-coloured specimens of *Polytrema miniaceum*.

A fragment of Alcyonarian largely composed of the agglutinated spicules.

Associated with these are *Sagenina frondescens* (on *Halimeda*) and *Cycloclypeus Carpenteri* (form A).

Dredgings west of Tutanga, 200 fathoms.

Specimen A 2.

Two rather massive pieces of organic calcareous rock and fragments of a Gorgoniid stem.

The largest piece of rock measures 12·5 × 6 × 3·5 cm., and consists of large flaky masses of *Polytrema planum* built in tiers, rudely resembling the nest of the wasp (*Vespa*); with many adherent foraminifera, bryozoa, *Serpulæ*, brachiopoda (*Crania*), and algæ. Besides *P. planum* the other foraminifera are *Polytrema miniaceum*, whose small pustular tests are scattered over a large portion of the rock, and *Carpenteria serialis*, sp. nov. (Pl. 35. fig. 3). There are apparently two kinds of algæ—one a thin, pink, encrusting form, and the other a thread-like or filamentose and branching organism rather doubtful in its affinity.

The smaller piece of rock measures 8·5 × 5 × 2·5 cm., and has a double nodular shape, with a lumpy surface, overgrown with *Polytrema planum*, *P. miniaceum*, and several species of bryozoa.

The alcyonarian stems are encrusted with a pink alga, and foraminifera (as *Carpenteria utricularis*, *Polytrema miniaceum*), a sponge, and numerous bryozoa.

South of Fuafatu, 25 fathoms (August 14th, 1897).

Reef-fragments with broken shells and many foraminifera. The latter are:—

Orbitolites complanata, rare.

Sagenina frondescens, common and well-grown, on shells and *Halimeda*.

Planorbulina acervalis, very rare, on *Halimeda*.

Polytrema planum, on *Halimeda*, and forming button-like masses.

P. miniaceum, very common.

Off Fuafatu, 60 fathoms (1897).

Specimen C 4.

A flat piece of coral covered with pink *Lithothamnion*, foraminifera, *Serpulæ*, bryozoa, and brachiopoda (*Crania*).

The foraminifera are *Sagenina frondescens*, *Haddonia torresiensis*, and *Polytrema miniaceum*.

Off Fuafatu, 60 fathoms (1897).

Specimen C 3.

Coral-rock encrusted with *Lithothamnion*, *Polytrema planum*, and bryozoa.

S.S.W. of Fuafatu, 60 fathoms (1897).

Specimen C 5.

Calcareous rock encrusted with *Lithothamnion*, foraminifera, a small coral, *Serpulæ*, and bryozoa.

The foraminifera are *Haddonia torresiensis*, *Carpenteria monticularis*, and *Polytrema miniaceum*.

South of Fuafatu, 119 fathoms (1897).

Reef-fragments, one of which measures 2·5 × 2 cm. It is encrusted with *Polytrema planum* to which are attached several specimens of *Haddonia torresiensis*. There are also specimens of *Cycloclypeus Carpenteri* (form A) in the accompanying sand.

TABLE *illustrating the* DISTRIBUTION *of* REEF-FORMING FORAMINIFERA (*adherent and encrusting species*) *round the Atoll of Funafuti* *.

	Name.	Localities.	Depths in fathoms.	Conditions of growth.
1.	*Sagenina frondescens* (Brady).	Pava, Funamanu, Tutanga, and Fuafatu.	30, 36, 50, 60, 136, 150, 200.	Found chiefly on *Halimeda* joints.
2.	*Haddonia torresiensis*, Chapman. (Pl. **35.** figs. 1 & 1 *a*.)	Pava, Funamanu, Tutanga, and Fuafatu.	25, 35, 40, 60, 80, 119, 136.	Adherent to reef-rock and reef-organisms.
3.	*Bdelloidina aggregata* Carter.	Pava and Funamanu.	25, 50, 60, 63.	Found growing on reef-rock, millepores, corals, and molluscan shells.
4.	*Carpenteria utricularis*, Carter.	Pava, Funamanu, Tutanga, and Fuafatu.	25, 50, 57, 60, 80, 94, 136, 150, 200.	Grows attached to *Halimeda*, Alcyonarian stems, millepores, or bare reef-rock.
5.	*Carpenteria balaniformis*, Gray.	Pava and Tutanga.	115–240.	Growing on deep-sea corals and *Serpulæ*.
6.	*Carpenteria monticularis*, Carter.	Funamanu, Tutanga, and Fuafatu.	25, 50, 60, 80, 86, 135, 200.	Growing attached to *Polytrema planum*, Alcyonarian stems, molluscan shells, or bare reef-rock.
7.	*Carpenteria rhaphidodendron*, Möbius. (Pl. **35.** fig. 2.)	? Pava; Funamanu and Fuafatu.	60, 80, ? 240.	Found only at two or three depths. Grows in massive clusters, throwing out tubes which are often joined terminally by a platform-like growth of *Polytrema planum*.
8.	*Carpenteria serialis*, sp. nov. (Pl. **35.** fig. 3.)	Tutanga.	200.	Attached to reef-fragments.
9.	*Polytrema planum* (Carter). (Pl. **35.** figs. 2 & 4.)	Pava, Funamanu, Falefatu, Tutanga, Fuafatu.	25, 38, 45, 50, 60, 63, 80, 117, 119, 135, 136, 200.	Found encrusting reef-rocks and rounding off sharp angular fragments by enwrapping them in successive layers of acervuline cells until the original contour entirely disappears. It even grows over living organisms, such as *Cycloclypeus*, until they are quite covered up by the rapid growth of the foraminifera.
10.	*Polytrema miniaceum* (Pallas).	Funamanu, Falefatu, Tutanga, and Fuafatu.	25, 38, 45, 50, 60, 80, 136, 200.	Growing profusely on *Polytrema planum*, *Halimeda* joints, or reef-rock.
11.	*Polytrema miniaceum*, var. *alba*, Carter.	Funamanu.	50.	Associated with *P. miniaceum* but very rare.

* This table includes data given in my earlier paper on the same subject. See Journ. Linn. Soc., Zool. vol. xxviii. pp. 1–27.

Besides the foregoing adherent foraminifera, the ordinary species of smaller dimensions which live freely on the reef play an important part by the enormous quantities of their tests which speedily become encrusted and consolidated by the growth of organisms. A cavernous rock is thus formed, the interstices of which do not become filled until a much later date in the history of the reef-formation.

Such noteworthy species are *Amphistegina Lessonii*, *Tinoporus baculatus*, *Heterostegina depressa*, *Calcarina hispida* (which, however, is one of the first organisms to disappear by solution), *Orbitolites complanata* and *O. marginalis*, and *Cycloclypeus Carpenteri*.

As regards the last named species, *C. Carpenteri*, it is interesting to note its occurrence at four localities round Funafuti, namely, Pava, Funamanu, Tutanga, and Fuafatu. It has a range in depth of 30–200 fathoms. At 50–60 fathoms both the megalospheric and the microspheric forms occur, form A greatly preponderating. At 80 fathoms form B (the microspheric or large discoid form) was most frequently dredged up alive by Prof. David.

Notes on Foraminifera from the Reef-fragments, Funafuti.

Carpenteria balaniformis, *Gray*.

Carpenteria balaniformis, Gray, 1858, Proc. Zool. Soc. Lond. vol. xxvi. p. 269, figs. 1–4.

C. balaniformis, Chapman, 1900, Journ. Linn. Soc., Zool. vol. xxviii. p. 13, pl. 4. figs. 1, 2.

Other deep-sea corals with numerous attached specimens of *C. balaniformis* have been sent on in further collections since the first paper on Funafuti Foraminifera was written. One of the corals came from 240 fathoms off Pava I., and is the deepest sample obtained from the reef. This specimen bears no less than 31 individuals of the above species distributed over the surface. A curious example of fusion between two shells also occurs, which points to the ability which this genus may possess of forming colonies and large masses of almost indefinite size, providing the growing test is not broken up by predatory fishes or by mechanical means.

CARPENTERIA RHAPHIDODENDRON, *Möbius*. (Pl. 35. fig. 2.)

? Polytrema brunnescens, J. D. Dana, 1849, U.S. Exploring Exped., Atlas Zoophytes, p. 707, pl. 61. fig. 3.

Rhaphidodendron album, Möbius, 1876, Tageblatt der 49 Versammlung deutscher Naturforscher und Aerzte in Hamburg, p. 115.

Carpenteria rhaphidodendron, Möbius, 1880, Beiträge zur Meeresfauna der Insel Mauritius und der Seychellen, Berlin, p. 81, pl. v. figs. 6–10, pl. vi. fig. 1–6.

It is possible that the specimen which Dana described as "pale brownish, thick incrusting, cavernous, surface gibbous, lacerate and very irregular," is a young specimen of the above species. Since the full-grown form has been so admirably figured and described by Möbius from Mauritius, it is unnecessary to further disturb the nomenclature by substituting Dana's name.

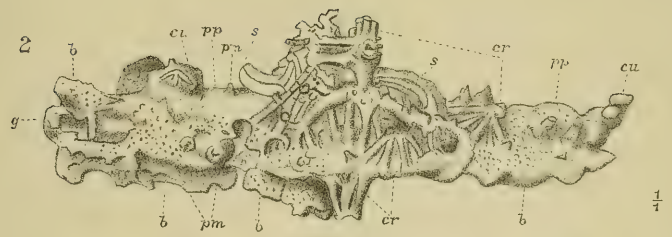
This species is very much in evidence in certain parts of the core obtained from Funafuti, where it sometimes constitutes thick layers between the ordinary foraminiferal sand and reef-rock. More often, however, it is represented only by fragments broken down to a more or less uniform size, as though by the agency of browsing animals.

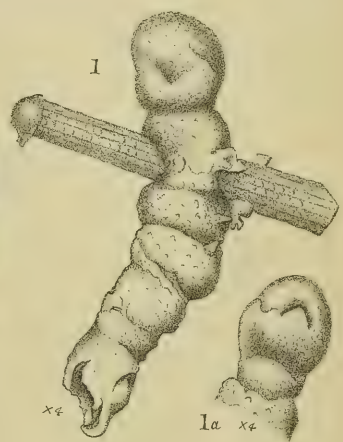
C. rhaphidodendron appears to be most at home in depths between 63 and 80 fathoms.

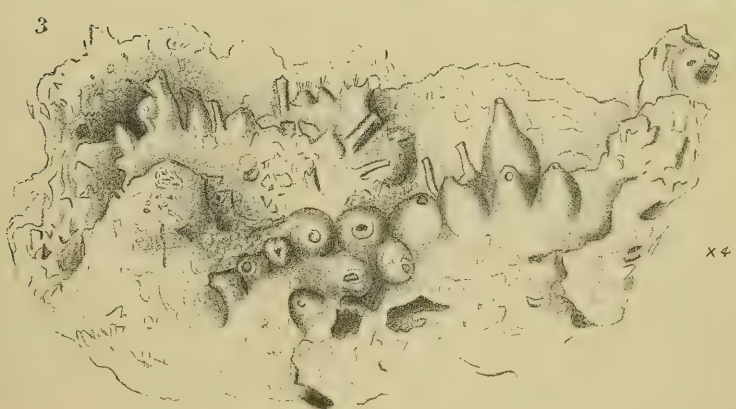
CARPENTERIA SERIALIS, sp. nov. (Pl. 35. fig. 3.)

Test hyaline, somewhat glassy or polished in texture, consisting of more or less numerous chambers sometimes shaped like a calabash or water-pot with a distinctly spouted aperture placed a little eccentrically, at others of a combination of flask and long cylindrical spout. The apertures, in fresh specimen, armed with sponge-spicules. Chambers arranged in roughly linear fashion or in a meandering series. Adherent to reef-rock. Diameter of the chambers at their base 1–2·25 millim. Diameter of aperture about ·3 millim. This organism appears at first sight to bear a deceptive resemblance to certain forms of Polyzoa.

Found at Tutanga, 200 fathoms. Frequent.







F. Chapman ad nat. del.
M.P. Parker lith.

Parker & West imp.

REEF-BUILDING FORAMINIFERA FROM FUNAFUTI.

V. A Summary *of the* Foraminifera *found at* depths *from* 16–200 fathoms round Funafuti, *in dredgings made by* Messrs. Halligan *and* Finckh.

In this table the results of the detailed examination of the sands obtained during the latter part of the work of the Expedition, in 1898, are given.

The columns are arranged in order of depth, the localities occupying a secondary place. The reason adduced for this is that in the case of Foraminifera from the loose sands found either in shallow or fairly deep water the temperature seems to be a more important factor than local surroundings; whereas in the case of the reef samples the organisms are largely dependent upon environment.

The dredgings include, besides Foraminifera, the following organisms—Calcareous Algæ (*Halimeda*, *Corallina*, *Lithothamnion*, and other genera), Calcisponges and loose spicules, Alcyonarian spicules, Serpulæ and boring Annelides, Polyzoa, Ascidian spicules, Lamellibranchiate shells, Heteropods, Gasteropods, Pteropods, Echinodermal plates and spines, Ostracoda (chiefly *Bairdia* and *Loxoconcha*) and other Crustacea.

In the annexed synopsis of species from the Funafuti Atoll, for the sake of uniformity of treatment and in order to enable a comparison with the Synopsis given in my former paper (pp. 206–209 of the present volume), the following significations are used:—v.r. = very rare, r. = rare, f. = frequent, c. = common, v.c. = very common.

TABLE OF THE FORAMINIFERA FOUND OUTSIDE THE FUNAFUTI REEF FROM 16 TO 200 FATHOMS.

No.	Name.	N. of Pava, 16 fms.	S. of Fuafatu, 25 ,,	N. of Pava, 32 ,,	N.W. of Pava, 33 ,,	N. of Pava, 35 ,,	W. of Tutanga, 35 ,,	N.W. of Pava, 36 ,,	S. of Fuafala, 40 ,,	Funamanu, 50 ,,	Tutanga, 50–60 ,,	S. of Fuafatu, 60 ,,	Tutanga, 115–200 ,,	Funamanu, 150 ,,	Tutanga, 200 ,,
1.	*Nubecularia divaricata*, Brady	...	...	v. r.	...	...	...	...	...	r.	v.r.	...	...	...	v.r.
2.	,, *lucifuga*, Defrance	...	...	...	...	...	v.r.	v.r.	...	...	...	...	...	v.r.	v.r.
3.	,, *tibia*, J. & P.	...	...	...	...	...	r.								
4.	*Biloculina oblonga*, d'Orb.	...	...	...	...	...	v.r.	...	...	...	f.	...	...	r.	
5.	,, *ringens* (Lam.)	...	...	...	...	...	...	v.r.	...	...	...	v.r.	...	v.r.	f.
6.	,, ,, var. *denticulata*, Brady	...	...	r.											
7.	*Spiroloculina robusta*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	...	f.
8.	,, *excavata*, d'Orb.	...	...	v.r.	...	v.r.	v.r.	c.	...	r.	c.	f.	...	v.c.	f.
9.	,, *limbata*, d'Orb.	...	...	v.r.	...	...	v.r.	...	...	r.	...	...	...	...	v.r.
10.	,, *nitida*, d'Orb.	...	...	...	...	...	...	v.r.	...	...	r.				
11.	,, ,, var. *foveolata*, Egger	...	...	c.	...	...	f.	c.	...	...	r.	v.r.	...	v.r.	
12.	,, *impressa*, Terquem	...	...	r.											
13.	,, *parvula*, sp. nov.	...	...	...	...	...	...	...	...	...	...	...	...	...	f.
14.	,, *antillarum*, d'Orb.	...	...	...	...	...	...	v.r.	...	...	...	...	...	...	r.
15.	,, *grata*, Terquem	...	...	f.	v.r.	v.r.	c.	f.	...	...	f.	...	..	...	r.
16.	,, *tenuiseptata*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
17.	,, *acutimargo*, Brady	...	...	c.	...	...	r.	r.	...	v.r.	...	...	...	r.	f.
18.	,, *fragillissima*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
19.	,, *crenata*, Karrer	...	...	...	...	...	v.r.	...	...	r.	f.	...	...	...	r.
20.	,, *asperula*, Karrer	...	..	...	v.r.										
21.	*Miliolina circularis*, Born	...	...	...	...	...	r.	...	...	r.	r.	...	...	v.r.	v.r.
22.	,, ,, var. *sublineata*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	v.r.	

23.	„ *labiosa* (d'Orb.)	...	...	r.										
24.	„ *subrotunda* (Mont.)	...	...	r.	...	...	v.r.	v.r.	...	...	r.	...	...	v.r.	
25.	„ *tricarinata* (d'Orb.)	...	...	r.	v.r.	v.r.	f.	...	...	v.r.					
26.	„ „ var. *Terquemiana*, Brady	...	...	...	...	v.r.	...	r.	...	...	...	...	...	r.	
27.	„ *seminulum* (Linn.)	...	...	...	...	...	...	...	...	...	...	..	...	...	r.
28.	„ *Cuvieriana* (d'Orb.)	...	..	...	...	...	r.	...	...	...	v.r.				
29.	„ *reticulata* (d'Orb.)	...	...	...	..	...	c.	v.r.	...	...	v.r.	...	...	...	r.
30.	„ *undosa* (Karrer)	...	...	f.	r.	...	v.r.	r.	...	v.r.	f.	...	...	v.r.	r.
31.	„ *Parkeri*, Brady	...	...	r.	...	...	f.	f.							
32.	„ *Ferussacii* (d'Orb.)	...	...	v.c.	...	...	v.c.	v.c.	...	r.	f.	r.	...	...	f.
33.	„ *agglutinans* (d'Orb.)	...	...	...	...	...	v.r.								
34.	„ *pulchella* (d'Orb.)	...	...	...	...	...	...	...	...	...	...	...	...	. .	v.r.
35.	„ *Linneana* (d'Orb.)	...	...	...	...	...	...	v.r.	...	...	r.	...	...	v.r.	
36.	„ *bicornis* (W. & J.)	...	...	...	...	...	v.r.	...	...	...	...	...	...	...	v.r.
37.	„ *alveoliniformis*, Brady	...	...	r.	r.	v.c.	...	v.c.	...	...	c.	...	...	v.r.	
38.	„ *oblonga* (Mont.)	...	...	...	...	...	v.r.	...	...	...	r.	...	...	...	r.
39.	„ *amygdaloides*, Brady	...	...	r.											
40.	„ *Bosciana* (d'Orb.)	...	...	...	...	...	v.r.	...	...	...	f.	...	...	r.	f.
41.	„ *funafutiensis*, Chap.	...	...	...	...	...	...	...	...	...	v.r.				
42.	„ *cultrata*, Brady	...	...	...	...	...	...	v.r.	..	...	...	...	...	...	r.
43.	„ *scrobiculata*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	...	f.
44.	„ *macilenta*, Brady	...	...	...	...	...	...	v.r.	...	v.r.	...	...	...	...	v.r.
45.	*Articulina conico-articulata* (Batsch)	...	...	...	...	...	v.r.	...	...	r.	r.	...	...	...	f.
46.	„ *lineata*, Brady	...	...	v.r.	...	...	v.r.	. .	...	r.	f.	...	...	...	v.r.
47.	„ *funalis*, Brady	...	...	...	...	...	...	...	...	...	r.				
48.	„ „ var. *inornata*, Brady	...	...	...	...	. .	...	...	...	f.					
49.	*Ophthalmidium tumidulum*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	v.r.	
50.	„ *cornu*, sp. nov.	...	...	...	...	...	...	...	...	...	r.				
51.	*Hauerina compressa*, d'Orb.	...	...	...	...	...	r.								
52.	„ *ornatissima* (Karrer)	...	...	r.	...	v.r.	c.	c.	...	f.	v.c.	...	...	v.c.	v.r.
53.	*Planispirina exigua*, Brady	...	...	v.r.	...	...	v.r.	...	...	v.r.	v.r.				
54.	„ *communis*, Seguenza	...	...	...	...	...	...	...	...	v.r.					
55.	*Sigmoilina celata* (Costa)	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.

Table of the Foraminifera found outside the Funafuti Reef from 16 to 200 fathoms (*continued*).

No.	Name.	N. of Fava, 16 fms.	S. of Fuafatu, 25 „	N. of Fava, 32 „	N.W. of Fava, 33 „	N. of Fava, 35 „	W. of Tutanga, 35 „	N.W. of Fava, 36 „	S. of Fuafala, 40 „	Funamanu, 50 „	Tutanga, 50–60 „	S. of Fuafatu, 60 „	Tutanga, 115–200 „	Funamanu, 150 „	Tutanga, 200 „
56.	*Cornuspira involvens*, Reuss	...	...	...	...	...	r.	...	...	...	...	...	...	...	f.
57.	*Peneroplis pertusus*, Forskål	...	v.r.	...	...	...	f.	v.r.	...	...	v.r.	...	...	...	v.r.
58.	,, *arietinus* (Batsch)	...	...	...	...	...	...	...	...	...	...	...	...	...	...
59.	,, (*Monalysidium*) *fitzus*, Gmelin	...	...	...	...	...	v.r.	...	...	...	...	...	...	...	...
60.	,, *Sollasi*, Chap.	...	...	...	...	...	v.r.	...	...	...	...	...	...	...	...
61.	*Orbitolites marginalis* (Lam.)	r.	c.	v.r.	v.r.	v.r.	c.	f.	...	r.	v.r.	f.	...	...	r.
62.	,, *duplex*, Carp.	...	v.r.	v.r.	v.r.	v.r.	r.	...	...	...	...	c.	...	f.	v.r.
63.	,, *complanata*, Lam.	r.	...	v.r.	r.	v.r.	f.	...	...	...	...	c.	...	f.	f.
64.	*Alveolina Boscii* (Defrance)	...	...	...	...	...	...	v.r.	...	...	v.r.	...	...	...	...
65.	*Sagenina frondescens* (Brady)	c.	v.r.	...	v.r.	f.	v.c.	v.r.	v.r.	f.	...	f.	...	v.c.	v.r.
66.	*Rzehakx scorpiurus* (Montfort)	...	...	...	...	...	...	...	...	...	...	...	...	...	...
67.	*Haplophragmium casxis* (Parker)	...	...	...	...	...	...	...	...	...	...	v.r.	...	...	...
68.	,, *tessellatum*, sp. nov.	...	...	...	...	v.r.	...	...	...	...	...	v.r.	...	...	...
69.	,, *agglutinans* (d'Orb.)	...	...	...	...	...	...	...	...	...	...	v.r.	...	...	...
70.	,, *inæquum*, Brady	...	...	...	...	...	...	...	...	...	...	v.r.	...	...	...
71.	*Placopsilina cenomana*, d'Orb.	f.	v.r.	v.r.	...	v.r.	f.	...	...	...	...	...	...	v.c.	v.r.
72.	*Bdelloidina aggregata*, Carter	...	...	...	...	...	...	...	...	...	...	v.r.	...	...	...
73.	*Haddonia torresiensis*, Chap.	...	...	...	...	v.r.	...	v.r.	...	...	f.	...	...	r.	v.r.
74.	,, *minor*, sp. nov.	...	r.	v.r.	...	r.	...	...	...	...	...	...	...	...	...
75.	*Trochammina squamata*, J. & P.	...	...	...	...	...	...	v.r.	...	r.	c.	...	...	...	...
76.	*Carterina spiculotesta*, Carter	...	...	...	...	...	...	...	...	...	...	...	...	...	...
77.	*Textularia foliuin*, P. & J.	...	...	...	...	...	...	...	...	...	v.r.	...	...	...	r.

78.	„ *concava*, Karrer	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
79.	„ *crispata*, Brady	...	...	...	...	...	...	...	...	...	v.r.	...	...	...	r.
80.	„ *transversaria*, Brady	...	...	v.r.	...	v.r.	...	...	...	...	...	...	...	...	v.r.
81.	„ *conica*, d'Orb.	...	...	f.	...	f.	f.	...	...	...	c.	...	...	v.r.	f.
82.	„ *trochus*, d'Orb.	...	...	...	...	...	r.								
83.	„ *gramen*, d'Orb.	...	...	...	...	...	r.	v.r.	...	v.r.	...	...	...	...	v.r.
84.	„ *agglutinans*, d'Orb.	...	...	...	...	...	...	v.r.	...	...	...	...	...	...	v.r.
85.	„ „ *porrecta*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	...	r.
86.	„ *sagittula*, Defrance	...	...	...	...	...	v.r.	...	...	...	f.				
87.	„ „ var. *fistulosa*, Brady	...	...	f.	...	v.r.	f.	v.r	...	...	...	...	...	...	r.
88.	„ *siphonifera*, Brady	...	...	f.	v.r.	r.	c.	c.	...	c.	f.	c.	...	v.c.	r.
89.	„ *rugosa* (Reuss)	...	...	v.r.	...	v.r.	v.c.	...	...	r.	v.c.	f.	...	v.r.	f.
90.	*Verneuilina spinulosa*, Reuss	...	...	r.	...	r.	r.	f.	...	f.	c.	...	...	r.	f.
91.	*Gaudryina rugosa*, d'Orb.	...	...	...	...	...	...	...	...	...	f.	v.r.	...	r.	f.
92.	„ *attenuata*, sp. nov.	...	...	...	...	...	r.								
93.	„ *rotunda*, sp. nov.	...	...	...	...	...	...	...	...	...	...	...	...	...	f.
94.	*Valvulina fusca* (Will.)	...	...	...	...	...	...	...	...	v.r.					
95.	*Clavulina angularis*, d'Orb.	...	...	...	r.	...	v.r.	r.	...	...	v.r.				
96.	„ *communis*, d'Orb.	...	...	...	...	...	...	...	...	...	...	...	...	..	v.r.
97.	„ *cylindrica*, Hantken	...	...	...	...	...	...	...	...	...	...	...	..	...	f.
98.	*Bulimina elegans*, d'Orb., var. *exilis*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
99.	„ *elegantissima*, d'Orb.	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
100.	„ *subteres*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
101.	„ *convoluta*, Will.	...	...	...	...	...	...	...	...	...	v.r.	...	...	...	v.r.
102.	*Virgulina subsquamosa*, Egger	...	...	...	...	...	...	...	...	...	v.r.				
103.	„ *Schreibersiana*, Cz.	...	...	...	...	...	...	f.							
104.	*Bifarina limbata* (Brady)	...	...	f.	...	...	f.	f.	...	f.	f.	...	...	c.	c.
105.	*Bolivina textularioides*, Reuss	...	...	...	...	...	r.	...	...	...	v.r.	...	...	...	r.
106.	„ *punctata*, dOrb.	...	...	...	...	...	v.r.	...	...	...	...	...	...	...	v.r.
107.	„ *porrecta*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
108.	„ *dilatata*, Reuss	...	...	...	...	...	...	...	...	...	v.r.	...	...	...	v.r.
109.	„ *robusta*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
110.	„ *arenosa*, Chap.	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.

Table of the Foraminifera found outside the Funafuti Reef from 16 to 200 fathoms (*continued*).

No.	ame.	N. of Pava, 16 fms.	S. of Fuafatu, 25 ,,	N. of Pava, 32 ,,	N.W. of Pava, 33 ,,	N. of Pava, 35 ,,	W. of Tutanga, 35 ,,	N.W. of Pava, 36 ,,	S. of Fuafala, 40 ,,	Funamanu, 50 ,,	Tutanga, 50-60 ,,	S. of Fuafatu, 60 ,,	Tutanga, 115-200 ,,	Funamanu, 150 ,,	Tutanga, 200 ,,
111.	*Cassidulina calabra*, Seguenza	...	...	...	...	...	...	...	...	...	v.r.	...	...	...	r.
112.	,, *crassa*, d'Orb	...	...	...	...	...	...	...	...	...	...	...	...	...	r.
113.	,, *lævigata*, d'Orb.	...	...	...	...	...	...	...	...	...	...	...	...	...	f.
114.	,, (*Orthoplecta*) *clavata*	...	...	...	...	...	...	...	...	...	v.r.	...	...	...	v.r.
115.	*Ehrenbergina serrata*, Reuss	...	...	...	...	...	...	...	...	...	...	...	...	...	f.
116.	*Cheilostomella ovoidea*, Reuss	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
117.	*Lagena striata*, d'Orb.	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
118.	,, *acuticosta*, Reuss	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
119.	,, *spiralis*, Brady	...	...	...	...	...	v.r.								
120.	,, *lagenoides*, Will.	...	...	...	...	...	...	...	...	...	...	...	...	...	r.
121.	,, *radiato-marginata*, P. & J.	...	...	...	...	...	...	...	...	...	v.r.	...	...	...	v.r.
122.	*Nodosaria comata* (Batsch)	...	...	...	...	...	...	...	...	...	...	...	...	...	f.
123.	,, *scalaris* (Batsch)	...	...	...	...	...	...	...	...	...	...	...	...	...	r.
124.	,, ,, var. *separans*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	...	f.
125.	,, *proxima*, Silvestri	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
126.	,, *plebeia*, Reuss	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
127.	,, *Roemeri*, Neugeboren	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
128.	,, *pauperata*, d'Orb.	...	...	...	...	...	...	...	...	...	...	...	...	..	f.
129.	,, *limbata*, d'Orb.	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
130.	,, *consobrina*, d'Orb.	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
131.	,, *communis*, d'Orb.	...	...	...	...	...	...	...	...	...	...	...	...	...	r.
132.	,, *filiformis* (d'Orb.)	...	...	...	...	...	...	...	...	...	...	...	...	v.r.	r.

133.	,, *subcanaliculata*, Neug.	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
134.	,, *vertebralis* (Batsch)	...	...	...	...	...	...	...	...	...	...	...	...	...	f.
135.	,, *intercellularis*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
136.	,, *obliqua* (Linné)	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
137.	*Lingulina carinata*, d'Orb. (see Pl. **36.** fig. 13)	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
138.	,, ,, var. *seminuda*, Hantken	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
139.	*Frondicularia spathulata*, Brady (see Pl. **36.** fig. 14).	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
140.	*Marginulina glabra*, d'Orb.	...	...	...	...	...	...	...	...	...	...	...	...	...	r.
141.	,, *soluta*, Reuss.	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
142.	,, *costata* (Batsch)	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
143.	*Vaginulina legumen* (Linné)	...	...	...	...	...	...	...	...	...	...	...	...	...	r.
144.	,, *linearis* (Mont.)	...	...	...	...	...	...	...	...	...	...	...	...	...	f.
145.	*Cristellaria gibba*, d'Orb.	...	...	...	...	...	...	...	...	...	v.r.	...	...	...	v.r.
146.	,, *rotulata* (Lam.)	...	...	...	...	...	v.r.	...	...	...	...	v.r.	...	...	f.
147.	,, *cultrata* (Mont.)	...	...	...	...	...	v.r.	...	...	...	v.r.	v.r.	...	...	c.
148.	,, *orbicularis*, d'Orb.	...	...	...	...	...	...	...	...	...	f.	...	...	...	r.
149.	,, *variabilis*, Reuss	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
150.	,, *reniformis*, d'Orb.	...	...	...	...	...	...	...	...	...	...	...	...	...	r.
151.	,, *articulata*, Reuss	...	...	...	...	...	...	r.	...	...	...	v.r.	...	...	f.
152.	,, *obtusata*, Reuss	...	...	...	...	...	v.r.								
153.	,, *Schlœnbachi*, Reuss	...	...	...	...	...	...	...	...	...	v.r.	...	v.r.	r.	r.
154.	,, *crepidula* (F. & M.)	...	...	...	...	...	...	...	...	...	...	...	...	...	f.
155.	,, *tenuis* (Born)	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
156.	,, *mirabilis*, sp. nov.	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
157.	*Polymorphina gutta*, d'Orb.	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
158.	,, *communis*, d'Orb.	...	...	...	...	...	...	...	...	...	v.r.				
159.	,, *compressa*, d'Orb.	...	...	...	...	...	...	...	...	...	v.r.	...	...	...	v.r.
160.	,, *Sequenzana*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
161.	*Uvigerina asperula*, Cz.	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
162.	,, *interrupta*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
163.	,, *angulosa*, Will.	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
164.	,, *porrecta*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	...	r.
165.	*Sagrina raphanus*, P. & J.	...	...	c.	...	...	c.	c.	...	c.	f.	r.	...	v.c.	c.

Table of the Foraminifera found outside the Funafuti Reef from 16 to 200 fathoms (*continued*).

No.	Name.	N. of Pava, 16 fms.	S. of Fuafatu, 25 ,,	N. of Pava, 32 ,,	N.W. of Pava, 33 ,,	N. of Pava, 35 ,,	W. of Tutanga, 35 ,,	N.W. of Pava, 36 ,,	S. of Fuafala, 40 ,,	Funamanu, 50 ,,	Tutanga, 50–60 ,,	S. of Fuafutu, 60 ,,	Tutanga, 115–200 ,,	Funamanu, 150 ,,	Tutanga, 200 ,,
166.	*Sagrina columellaris*, Brady	...	...	...	...	...	...	...	...	r.	...	...	...	c.	r.
167.	*Ramulina globulifera*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	...	r.
168.	*Globigerina bulloides*, d'Orb.	...	...	r.	...	r.	f.	...	...	...	...	r.	...	...	v.c.
169.	,, ,, var. *triloba*, Reuss	...	...	r.	...	f.	c.	f.	...	...	c.	...	...	v.c.	c.
170.	,, *rubra*, d'Orb.	...	...	...	...	...	r.	...	...	v.r.	...	...	...	...	f.
171.	,, *Dutertrei*, d'Orb.	...	...	...	...	...	...	...	...	r.	r.	...	...	...	v.r.
172.	,, *pachyderma*, Ehr.	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
173.	,, *subcretacea*, sp. nov.	...	...	v.r.	...	v.r.	...	v.r.	...	v.r.	...	...	...	...	v.r.
174.	,, *æquilateralis*, Brady	...	...	v.r.	...	...	...	...	...	...	r.	v.r.	...	v.r.	c.
175.	,, *conglobata*, Brady	...	...	f.	...	...	f.	r.	...	c.	r.	v.r	...	r.	c.
176.	,, *saculifera*, Brady	...	...	v.r.	...	r.	v.r.	...	...	v.r.	f.	r.	...	...	c.
177.	,, *digitata*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
178.	,, *dubia*, Egger	...	...	...	...	...	...	...	...	...	...	...	...	...	r.
179.	*Orbulina universa*, d'Orb.	...	...	v.r.	...	...	v.r.	...	...	v.r.	f.	...	...	r.	v.c.
180.	*Candeina nitida*, d'Orb.	...	...	...	...	...	...	...	...	v.r.	v.r.	...	...	...	f.
181.	*Sphæroidina dehiscens*, P. & J.	...	...	...	...	r.	...	...	...	...	...	r.	...	...	c.
182.	*Pullenia obliquiloculata*, P. & J.	...	...	v.r.	...	...	r.	...	...	v.r.	f.	r.	...	...	c.
183.	*Spirillina vivipara*, Ehr.	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
184.	,, *inæqualis*, Brady	...	...	c.	...	...	r.	r.	...	f.	...	...	...	...	r.
185.	,, *tuberculo-limbata*, Chap.	...	...	v.r.	...	v.r.	f.	r.	...	...	r.	r.	...	c.	
186.	,, *spinigera*, Chap.	...	...	r.	...	...	v.r.	...	...	v.r.	c.	...	...	v.r.	f.
187.	,, *limbata*, Brady	...	...	...	...	...	v.r.								

188.	„ *decorata*, Brady, var. *unilatera*, nov.	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
189.	*Patellina corrugata*, Will.	...	...	v.r.	...	...	...	...	...	v.r.	...	...	...	...	f.
190.	*Cymbalopora Poeyi* (d'Orb.)	...	...	...	...	...	f.	...	...	r.	c.	v.r.	...	...	c.
191.	„ „ var. *squamosa*, d'Orb.	...	...	...	v.r.	...	v.r.	r.	...	f.	f.				
192.	„ *tabellaeformis*, Brady	...	...	...	...	...	...	...	...	v.r.	r.	...	...	r.	c.
193.	„ (*Tretomphalus*) *bulloides* (d'Orb.)	...	...	...	...	...	r.	...	...	...	r.	r.	...	...	f.
194.	„ „ *inversa*, sp. nov.	...	...	...	...	...	c.	...	...	v.r.	...	...	...	...	f.
195.	*Discorbina araucana* (d'Orb.)	...	...	...	...	...	...	...	...	...	v.r.	...	...	v.r.	
196.	„ *Bertheloti* (d'Orb.)	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
197.	„ *parisiensis* (d'Orb.)	...	...	...	...	...	v.r.	...	...	v.r.	r.				
198.	„ *rugosa* (d'Orb.)	...	...	...	...	...	v.r.	...	...	v.r.	r.	...	...	...	v.c.
199.	„ *globularis* (d'Orb.)	...	...	v.r.	...	...	...	...	...	...	...	...	...	...	v.r.
200.	„ *concinna*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
201.	„ *rosacea* (d'Orb.)	...	...	v.r.	...	...	r.								
202.	„ *Vilardeboana* (d'Orb.)	...	...	...	...	...	...	v.r.							
203.	„ *patelliformis*, Brady	...	...	...	...	...	v.r.	v.r.							
204.	„ *turbo* (d'Orb)	...	...	...	...	...	r.	v.r.	...	...	...	...	...	...	v.r.
205.	„ *opercularis* (d'Orb.)	...	...	...	...	...	...	...	...	v.r.	...	...	...	v.r.	r.
206.	„ *orbicularis* (Terq.)	...	...	c.	...	...	f.	c.	...	c.	r.	...	...	r.	r.
207.	„ *tubero-capitata*, Chap.	...	...	f.	...	...	f.	...	...	c.	r.	...	...	f.	
208.	„ *rarescens*, Brady	...	...	r.	...	...	...	...	...	r.	...	...	...	...	f.
209.	„ *allomorphinoides* (Reuss)	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
210.	„ *pulvinata*, Brady	...	...	v.r.	...	...	...	...	...	...	...	...	...	...	v.r.
211.	„ *biconcava*, P. & J.	...	...	...	...	...	...	...	...	r.	...	...	...	...	r.
212.	*Planorbulina mediterranensis*, d'Orb.	...	...	v.r.	...	...	...	...	...	...	...	...	...	v.r.	v.r.
213.	„ *larvata*, P. & J.	...	...	c.	v.r.	v.r.	c.	v.c.	...	...	f.	...	...	...	r.
214.	„ „ var. *crispata*, Chap.	...	...	...	...	...	v.r								
215.	„ *acervalis*, Brady, var. *fimbriata*, Chap.	...	...	v.r.	...	...	...	...	...	...	f.				
216.	*Truncatulina lobatula* (W. & J.)	...	...	r.	...	...	v.r.	...	...	v.r.	f.	...	...	...	f.
217.	„ *variabilis* (d'Orb.)	...	...	...	...	...	...	...	...	v.r.	r.	...	...	...	v.r.
218.	„ *tenuimargo*, Brady	...	...	...	..	..	...	...	...	...	...	...	...	...	f.
219.	„ *refulgens* (Montfort)	...	...	...	...	...	...	...	...	r.	r.	...	...	r.	r.
220.	„ *Wuellerstorfi*, Schwager	...	...	...	...	...	...	...	...	r.	...	...	...	...	f.

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221.	*Truncatulina Ungeriana* (d'Orb.)	...	...	...	...	...	v.r.	v.r.	...	r.	f.	...	...	r.	r.
222.	,, *Akneriana* (d'Orb.)	...	...	v.r.	...	...	...	...	...	...	...	...	...	...	r.
223.	,, *rosea* (d'Orb.)	...	...	...	...	..	v.r.								
224.	,, *culter*, J. & P.	...	...	...	...	...	v.r.	...	...	...	...	...	...	f.	v.r.
225.	,, *rostrata*, Brady	..	...	r.	...	v.r.	c.	c.	...	v.r.	c.	r.	...	c.	
226.	,, *Haidingerii* (d'Orb.)	...	...	...	...	...	...	...	...	v.r.	...	...	...	...	r.
227.	,, *pygmæa*, Hantken	...	...	...	...	...	...	...	...	...	v.r.	...	...	...	v.r.
228.	,, *humilis*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
229.	,, *præcincta* (Karrer)	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
230.	,, *reticulata* (Cz.)	...	...	f.	...	...	...	f.	...	...	f.	...	...	...	r.
231.	,, *soluta*, Brady	...	...	r.	...	...	v.r.	...	...	r.	...	...	...	f.	
232.	,, *echinata*, Brady	...	...	...	...	...	...	...	...	..	...	...	...	v.r.	r.
233.	*Anomalina ammonoides* (Reuss)	...	...	...	...	...	...	...	...	...	v.r.				
234.	,, *grosserrugosa* (Gümbel)	...	...	...	...	...	...	...	...	...	...	...	...	...	r.
235.	,, *coronata*, P. & J.	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
236.	*Carpenteria proteiformis*, Goës	...	...	...	...	...	...	...	...	...	v.r.	...	...	...	f.
237.	,, *balaniformis*, Gray	...	...	...	...	...	...	...	...	r.	...	...	v.c.	v.r.	v.r.
238.	,, *monticularis*, Carter	...	...	...	...	...	...	...	...	...	...	...	...	...	v.r.
239.	,, *utricularis*, Carter	...	...	...	...	...	...	...	...	r.	...	...	...	c.	
240.	,, *rhaphidodendron* Möbius	v.r.	...	...	...	...	v.r.	r.	...	...	...	...	...	c.	
241.	*Pulvinulina Menardii* (d'Orb.)	...	...	...	...	...	...	...	...	...	r.	...	...	v.r.	f.
242.	,, *tumida*, Brady	...	...	...	...	...	...	...	...	...	r.	...	...	...	f.

243.	„ *patagonica* (d'Orb.)	...	...	...	...	...	...	...	...	v.r.					
244.	„ *canariensis* (d'Orb.)	...	...	...	...	..	...	...	...	v.r.	...	...	...	...	v.r.
245.	„ *concentrica*, (P. & J.)	...	...	...	...	...	...	...	...	v.r.	f.	...	...	...	f.
246.	„ *repanda* (F. & M.)	...	...	v.r.	...	...	f.	r.	...	r.	c.	f.	..	v.c.	f.
247.	„ „ var. *concamerata* (Mont.)	...	...	...	...	v.r.	f.	...	...	...	r.	...	...	...	f.
248.	„ *punctulata* (d'Orb.), var. *scabra*. nov.	...	...	...	...	...	...	...	...	...	...	...	...	...	r.
249.	„ *elegans* (d'Orb.)	...	...	...	...	...	...	...	...	...	...	...	...	...	c.
250.	„ *proceda*, Brady	...	...	...	...	...	...	...	...	...	...	...	...	...	f.
251.	„ *exigua*, Brady	...	...	...	...	...	...	r.							
252.	„ *Haueri*, d'Orb.	...	...	...	...	...	...	...	...	v.r.					
253.	„ *auricula*, F. & M.	...	..	...	...	...	...	...	...	...	v.r.				
254.	„ *lateralis*, Brady	...	...	...	...	...	...	...	...	...	r.				
255.	*Calcarina hispida*, Brady	...	...	r.	f.	r.	c.	c.	...	v.r.	f.	c.	...	f.	r.
256.	„ *Defrancii*, d'Orb.	...	...	...	...	...	...	r.	...	...	v.r.				
257.	*Tinoporus baculatus* (Montf.)	...	...	v.r.	r.	r.	f.	f.	...	...	v.r.	...	...	r.	f.
258.	*Gypsina globulus* (Reuss)	...	...	v.r.	..	...	c.	r.	...	r.	f.	f.	...	f.	r.
259.	„ *inhærens* (Schultze)	...	..	v.r.	...	...	...	...	...	v.r.	...	...	...	...	v.r.
260.	„ *vesicularis*, P. & J.	...	...	r.	v.r.	...	...	r.	...	...	r.	...	...	f.	v.r.
261.	„ „ var. *monticulus*, Chap.	...	...	v.r.	v.r.	...	...	v.r.	...	...	...	...	...	v.r.	
262.	„ „ var. *squamiformis*, Chap.	...	...	r.	...	...	...	...	...	c.	...	r.	...	v.c.	v.r.
263.	*Polytrema planum*, Carter	...	c.	...	...	...	f.								
264.	„ *miniaceum* (Pallas)	c.	c.	r.	v.r.	r.	f.	v.c.	f.	f.	f.	c.	...	v.c.	c.
265.	„ „ var. *alba*, Carter	...	...	...	...	...	r.	r.	...	...	...	...	...	r.	r.
266.	*Nonionina scapha* (F. & M.)	...	...	...	...	...	v.r.	...	...	...	r.	...	...	...	v.r.
267.	„ *depressula* (Mont.)	..	...	v.r.	.	...	v.r.	v.r.	...	r.	c.	..	...	v.r.	f.
268.	„ *umbilicatula* (Mont.)	...	...	...	...	...	...	...	...	...	v r.	...	...	...	v.r.
269.	*Polystomella macella*, F. & M.	...	...	...	...	...	...	...	...	...	v.r.	...	...	...	v.r.
270.	„ *crispa* (Linné)	...	...	. .	...	v.r.	...	...	...	...	f.	...	...	...	v.r.
271.	*Amphistegina Lessonii*, d'Orb.	...	...	v.c.	c.	c.	v.c.	v.c.	f.	v.c.	c.	v.c.	...	v.c.	c.
272.	*Heterostegina depressa*, d'Orb. Form A	v.r.	f.	v.c.	v.c.	v.c.	v c.	v.c.	...	c.	v.c.	f.	...	v.c.	c.
	„ „ „ „ B	...	...	...	...	...	...	...	...	...	...	r.			
273.	*Cycloclypeus Carpenteri*, Brady. Form A	...	..	...	...	...	c.	v.r.	f.	c.	ex.c.	c.	...	v.c.	v.c.
	„ „ „ „ B	...	...	...	...	...	...	...	...	...	f.	...	at 135 fms. freq.	...	f.

Note on New Species from the Sands of the Reef-slope.

Spiroloculina parvula, sp. nov. (Pl. 36. fig. 5.)

Test ovate, complanate, extremities produced. Oral extremity usually terminating in a tubular prolongation, with an everted rim. Segments few and broad, marked by salient sutural edges; surface of segments more or less excavated. Length ·35 mm.

Off Tutanga, 200 fathoms; frequent.

Affinities.—This form seems to be intermediate between Brady's *Spiroloculina limbata* var.* and Terquem's *S. impressa*†. From the former of these it differs chiefly in its smaller size and spouted orifice, and from the latter in having a more circularly ovate outline.

Ophthalmidium cornu, sp. nov. (Pl. 36. fig. 6.)

Test ovate, compressed; the early spiral tube small and neatly coiled; the later Spiroloculine segments large and few in number, and partly concealing the spiral portion of the shell. The later segments have a thin peripheral flange, as in *O. inconstans*. Aperture trumpet-shaped and opening towards one side of the test. Length of test ·5 mm. or less.

Off Tutanga, 50–60 fathoms; rare.

Haplophragmium cassis (*Parker*). (Pl. 36. fig. 8.)

Lituola cassis, Parker, 1870 (in Dawson's paper), Canad. Nat. n. s. vol. v. p. 177; p. 180, fig. 3.

Haplophragmium cassis (Parker), Brady, 1884, Rep. Chall. vol. ix. p. 304, pl. xxxiii. figs. 17–19.

The tendency in our specimens is for the oblique chambers to be subdivided, giving an appearance like that of *Cassidulina* to the test. The species is, however, extremely variable. Until Millett recorded this species from the Malay Archipelago, it appeared to be confined to the colder areas of northern seas.

W. of Tutanga, 35 fathoms; very rare.

Haplophragmium tesselatum, sp. nov. (Pl. 36. fig. 9.)

Test moderately thin, compressed, the spiral commencement subcircular in outline, septation very obscure; later chambers few, constricted at the septal lines, and arranged in an irregular rectilineal manner. Surface of shell marked by polygonal areolæ. Length of test 1·3 mm.

* Rep. Chall. 1884, vol. ix. p. 151, pl. x. figs. 1, 2.

† Mém. Soc. Géol. France, sér. 3, 1878, vol. i. p. 53, pl. x. fig. 8.

Affinities.—The nearest allied form to this species is *H. calcareum*, Brady *, but the latter has the initial portion of the test more inflated, and is composed of irregular calcareous particles. The test in *H. tesselatum* is formed of angular chips cemented by a harder substance which stands out in relief above the fragments themselves.

Off Funamanu, 50 fathoms; very rare.

Gaudryina attenuata, sp. nov. (Pl. 36. fig. 10.)

Test elongate, somewhat sinuate or twisted; commencing with a sharply triangular series of chambers arranged triserially, followed by an irregular textularian arrangement, and finally by two or three pairs of subglobular chambers. Length of test about 1·3 mm.

Affinities.—This species is not unlike *G. baccata*, Schwager †, but differs in having an acutely angular commencement, and the test is much more attenuate.

W. of Tutanga, 35 fathoms; rare.

Gaudryina rotunda, sp. nov. (Pl. 36. figs. 11 *a–c*.)

Test short and stout or subrotund; the earlier triserial chambers are subglobose, and these are quickly followed by subglobose chambers slightly flattened laterally and arranged in a biserial manner. Aperture a crescentic textularian slit. Shell-wall arenaceous, somewhat coarse in texture and whitish. Length of test about 2·2 mm.; greatest width 2 mm.

At a first glance this species might be taken for *Verneuilina propinqua*, Brady ‡, which, however, is distinctly biserial in the later part of the shell.

This species was found only at one locality, and the specimens in point of size are all much alike.

Off Tutanga, 200 fathoms; frequent.

Bifarina limbata (*Brady*). (Pl. 36. fig. 12.)

The general tendency of this species as it occurs at Funafuti is, when fully developed, towards the dimorphous genus *Bifarina*. It has the later chambers arranged in a uniserial manner, and they are connected internally by a siphonate tube, terminating in a phialine aperture. The general arrangement of the test in our specimens is less distinctly textularian than in the

* Rep. Chall. 1884, vol. ix. p. 302, pl. xxxiii. figs. 5–12.

† Novara-Exped., Geol. Theil, vol. ii. 1866, p. 200, pl. iv. fig. 12.

‡ Rep. Chall. 1884, vol. ix. p. 387, pl. xlvii. figs. 8–14.

recognized specimens of *Bolivina*. The best specimens in the Funafuti dredgings come from Funamanu, 150 fathoms, and from Tutanga at 200 fathoms. For other occurrences, see Table, p. 398.

Cristellaria mirabilis, sp. nov. (Pl. 36. fig. 15.)

Test complanate, subovate; broad at the distal end, narrowing towards the aboral end, which carries an alate margin. The commencement of the shell has two or three small imperfect and crescentic costulæ on the lateral surface. Sutural lines faintly marked, oblique and recurved towards the oral margin of the shell. Length 7 mm.; approximate breadth 5·5 mm.

Off Tutanga, 200 fathoms; very rare.

Globigerina subcretacea, sp. nov. (Pl. 36. figs. 16 *a*, *b*.)

Globigerina cretacea ?, Brady (non d'Orbigny), 1884, Rep. Chall. vol. ix. p. 596, pl. lxxxii. fig. 10.

The above recent species has hitherto been referred to the Cretaceous type of *G. cretacea*. There is, however, no reason for retaining that name for the recent specimens, for they differ essentially from the typical Chalk *Globigerinæ*. The recent specimens have a thick structured shell-wall: the chambered whorls of the test are few, and the spire is depressed or even excavate.

Brady remarks *, concerning these recent forms:—"I have never met with recent specimens, either amongst surface-organisms, or in bottom-ooze, which presented exactly the same characters as the typical Cretaceous variety; though shells similar in general conformation, and more nearly related to *Globigerina cretacea* than to any other recognized modification of the genus, are not uncommon in certain localities."

This species, in common with others of the same genus, increases in frequency in the deeper dredgings taken round Funafuti.

Spirillina decorata, *Brady*, var. unilatera, nov. (Pl. 36. figs. 17 *a*, *b*.)

Test with one face having the whorls rounded and the surface smooth, or with traces of linear markings across the tube; the other face resembling that of the type form *S. decorata*, Brady †. Diameter of test ·25 mm.

* Rep. Chall. 1884, vol. ix. p. 597.

† Ibid. p. 633, pl. lxxxv. figs. 22-25.

The inæquilateral modifications of *Spirillinæ* are not unfrequent at Funafuti, and are of much interest since they point to the rotaline affinities which the genus has towards shells of the trochoid type. The smooth, more or less tumid surface may be regarded as the superior, and the ornate surface as the inferior face.

Off Tutanga, 200 fathoms; very rare.

Cymbalopora (Tretomphalus) inversa, sp. nov. (Pl. 36. figs. 18 *a–c*.)

Test with the earlier chambers arranged as in *Cymbalopora*, followed by an inflated subspherical series enveloping one face of the earlier segments. In this species the secondary inflated portion covers over the superior primordial face of the shell, whereas in *C.* (*T.*) *bulloides* the reverse is the case*. The inflated shell has the surface often coarsely perforate as in *C.* (*T.*) *bulloides*, but not invariably so.

A section passing through the test in a median direction (that is to say, vertically through the spire) proves this species to be a remarkable case in which the sarcode and accompanying test have been drawn back, so to speak, over the earlier part of the shell. The inflated shell, agreeing with the "brood-chamber" in *C. bulloides*, is in our Funafuti specimens almost invariably filled with an (?) aragonitic deposit showing a distinctly radial and concentric structure. The external coloration of the inflated part of the shell is milky-white.

Width of test ·45 mm.

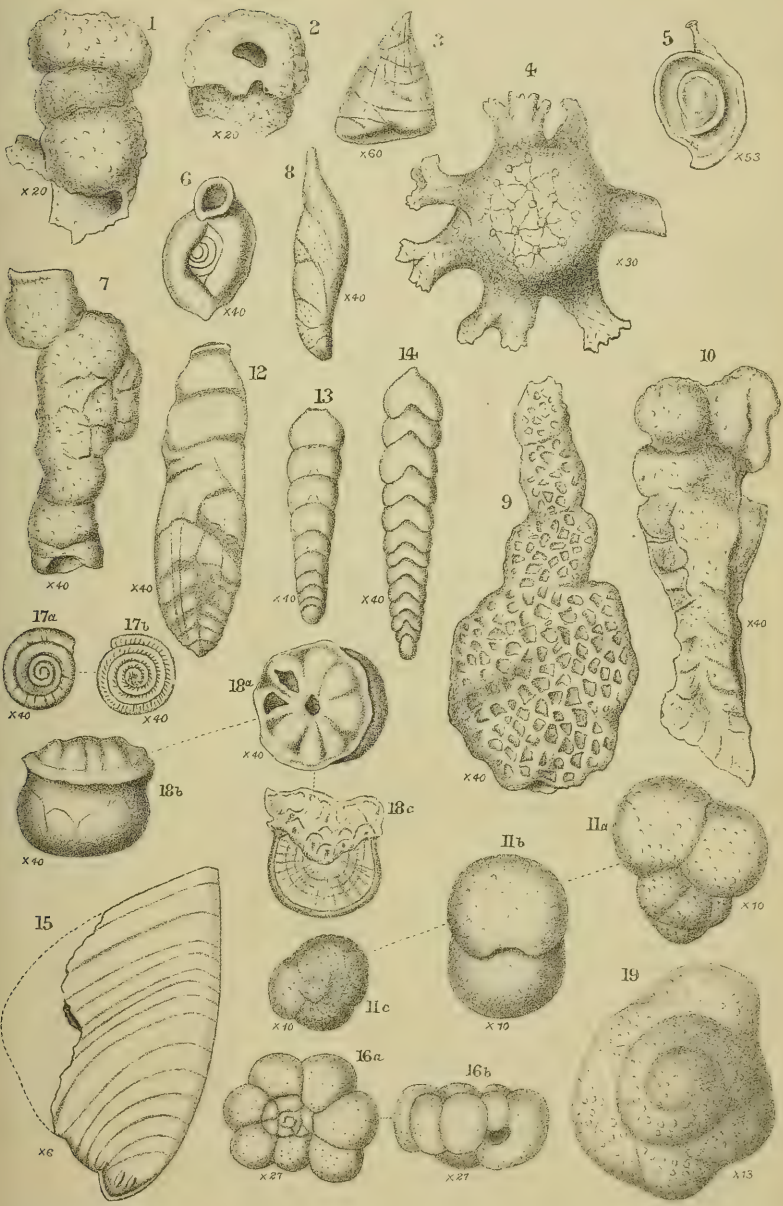
W. of Tutanga, 35 fathoms, common; off Funamanu, 50 fathoms, very rare; off Tutanga, 200 fathoms, frequent.

Pulvinulina punctulata (*d'Orbigny*), var. scabra, nov. (Pl. 36. fig. 19.)

The present variety differs from the type essentially in the coarse scabrous surface of the test, evidently the result of a secondary thickening of the shell round the exterior of the perforations or tubules of the ordinary shell-wall. Greatest diameter of test 2·4 mm.

Off Tutanga, 200 fathoms; rare.

* *Rosalina bulloides*, d'Orbigny, 1839, Foram. Cuba, p. 104, pl. iii. figs. 2–5.
Cymbalopora (*Tretomphalus*) *bulloides* (d'Orb.), Brady, 1884, Rep. Chall. vol. ix. p. 638, pl. cii. figs. 7–12.



F. Chapman ad nat. del.
M.P. Parker lith.

Parker & West imp.

FORAMINIFERA FROM FUNAFUTI.

In addition to the 273 species and varieties above recorded, from the sands of the reef-slopes, the lists previously given, exclusive of the lagoon fauna, include 19 other forms, namely:—

Nubecularia Bradyi, *N. lacunensis*, *Biloculina irregularis*, *Spiroloculina canaliculata*, *Miliolina trigonula*, *M. Boueana*, *M. tricarinata* var. *Bertheliniana*, *Peneroplis* (*Monalysidium*) *cylindracea*, *Orbitolites complanata* var. *plicata*, *Verneuilina Davidiana*, *Discorbina tabernacularis*, *D. acuminata*, *Planorbulina acervalis*, *P. retinaculata*, *Carpenteria serialis*, *Calcarina Spengleri*, *C. hispida* var. *pulchella*, *Tinoporus baculatus* var. *florescens*, and *Polystomella striatopunctata*; thus bringing the total number to 292 species and varieties.

VI. Notes *on the* Distribution *of some of the* Species *of* Foraminifera *from the* Reef-slope *at* Funafuti.

The shallow-water deposits of modern coral-reef areas are generally believed to contain, as a rule, few species of Foraminifera, but what is lacking in variety is usually compensated for by quantity. The exceptions to this rule are the faunas recorded from Raine's Islet, Torres Straits, and the present one from Funafuti. At the first-named locality the total number of Foraminifera found by Brady was 255 species and varieties. The number now recorded from the outer reef and beach of Funafuti amounts to 292. At a casual glance, however, the beach-sands, even at Funafuti, are apparently composed of about half a dozen forms, and it is only by a detailed examination of samples taken in the locality from various places and depths that we have been enabled to record such a rich foraminiferal fauna.

It will be as well to consider the distribution of certain of the Foraminifera met with to the present time on the reef-slope of Funafuti under three heads:—the encrusting or reef-forming foraminifera; the bottom-living forms; and the pelagic species.

The Encrusting Foraminifera.

Those which call for special notice on account of their profuse growth are *Carpenteria rhaphidodendron* and *Polytrema planum*.

The depth at which *C. rhaphidodendron* finds its habitat is very clear from the records obtained, for it was frequently found in two localities at depths of 60 and 80 fathoms. Fragments were also recorded from a sample at 180 fathoms; a doubtful

occurrence at 240 fathoms is recorded. The massive *Polytrema planum* is found at almost all depths from shallow water to 200 fathoms, but it appears to attain its highest development at a depth of 80 fathoms. It is well distributed round the atoll.

The Bottom-living or Benthos species of Foraminifera.

The species likely to be useful in affording data as to depth and other conditions of existence, in conjunction with the information derived from an examination of the consolidated or sandy material from the deep boring in the atoll, seem to be the following:—

Orbitolites marginalis.—This species occurs in its highest development and most frequently in the beach-sands, where at one place it is excessively common. It is also abundant at depths of 32 and 36 fathoms. At other depths it is found in less profusion, and is rare at 200 fathoms.

O. duplex.—Although this is a common species in certain parts of the core from the main boring, it is by no means so in the dredgings, for it never occurs in larger numbers than three or four in any of the samples. It is found as far down as 200 fathoms, but is very rare at that depth.

O. complanata.—This is recorded from three samples of beach-sands, and occurs at two of them in abundance. It is somewhat rare at the various levels down to 200 fathoms, excepting in one spot at a depth of 60 fathoms, where it is common.

Alveolina Boscii.—This is another species which occurs in the deep-boring at certain places with some frequency, but which is only found in two places on the reef-slope, at 36 fathoms and 50–60 fathoms. A solitary specimen was noticed adhering to a reef-fragment from the shore. With regard both to this species and *Orbitolites duplex,* either the conditions at the present time and those of the past when the atoll was being built up differ, or, as is very probable, the species noted are extremely local in their distribution, and thus have been overlooked by the collector.

Calcarina hispida is very common in certain of the beach-sands, and is also fairly abundant at depths of 35, 36, and 60 fathoms on the reef-slope.

Amphistegina Lessoni and *Heterostegina depressa* occur at all depths at Funafuti down to 200 fathoms. Both species are at their best, in point of size, at about 36 fathoms.

Cycloclypeus Carpenteri.—This species is recorded as occurring

in comparative abundance from 50 to 200 fathoms. At a depth of 50–60 fathoms it appears to be in greatest profusion, associated with form B.

The Pelagic Foraminifera.

On reference to the foregoing Distribution Table it will be noticed that the pelagic species found in the dredgings almost uniformly increase in number according to the depth of water, and concurrently as the open water of the ocean is approached. This is exactly what might be expected, since the sides of the atoll present an even slope, and there are no other islands in the vicinity. An exception to this rule is *Globigerina conglobata*, which is frequently found in the shallow sands round the atoll. The thickness of the test in this species is a striking feature, and is comparable with other pelagic forms originally thin-shelled, but which become possessed of a thickened shell-wall on assuming the conditions of life in common with other bottom-living forms.

The list of pelagic species occurring at Funafuti is as follows:—*Globigerina bulloides*, *G. bulloides* var. *triloba*, *G. rubra*, *G. Dutertrei*, *G. pachyderma*, *G. subcretacea*, *G. æquilateralis*, *G. conglobata*, *G. sacculifera*, *G. digitata*, *G. dubia*, *Orbulina universa*, *Candenia nitida*, *Sphæroidina dehiscens*, *Pullenia obliquiloculata*, *Cymbalopora* (*Tretomphalus*) *bulloides*, *Pulvinulina Menardii*, *P. tumida*, and *P. canariensis*.

The pelagic species noted from the beach-sands are *Globigerina sacculifera* and *Cymbalopora* (*Tretomphalus*) *bulloides*; whilst from the shallowest dredgings of the lagoon on the open side small specimens of *Globigerina bulloides* and its variety *triloba* have occurred with some frequency.

In bringing to a conclusion the main results on the Foraminifera of the dredged material down to 200 fathoms from Funafuti, it gives me much pleasure to reiterate my sincere thanks to those who have so carefully collected the material upon which this examination has been based; as well as to Prof. Judd, C.B., for facilities very kindly afforded for studying the collections at the Royal College of Science. My thanks are also due to my wife for assistance in elaborating this work, and to Mr. E. J. Tailin for his help in the selection of specimens.